Light and Lighting

Official Journal of the Illuminating Engineering Society.

Incorporating "The Illuminating Engineer."

32, Victoria St., London, S.W.1.

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Vol. XXXV.—No. 4 April, 1942 PRICE NINEPENCE Subscription 10/6 per annum, post free

Fluorescent Lamps

NO other subject in the lighting field can rival fluorescent lighting. It has the triple advantage of illustrating the scientific principles underlying the production of light, lending itself wonderfully well to demonstrations, and having immediate practical applications in industry.

So it is not surprising that two papers on this subject, read in London this month with an interval of only two days (see pp. 45 and 46), both drew large audiences. On the occasion of Mr. Aldington's paper before the I.E.S. the lecture theatre was more than filled to capacity. Two days later, when a similar paper was read by Mr. L. G. Davies and his colleagues to the Installations Section of the I.E.E., their large theatre was also well filled. There were, moreover, many who had taken advantage of the opportunity to hear both papers.

All this despite the fact that we have to ration ourselves in this delightful form of lighting, concentrating on one standard type of lamp and reserving its use, almost exclusively, for factories engaged on work of national importance. The subject promises to be even more entrancing in time to come, when the full possibilities of this outstanding development in the lighting field can be fully realised.

I.E.S. Meetings in Newport and Swansea

As previously announced, the I.E.S. South Wales Group has been breaking new ground by arranging meetings in other cities besides Cardiff, where the Group originated. On March 19, Mr. R. O. Ackerley addressed a meeting in Newport, taking as his subject the lighting and reconstruction programme. Those present showed keen interest in this problem. Some of them were perhaps a little surprised to discover how much the I.E.S. is doing in addition to the holding of meetings. We have since received from Mr. S. G. Turner, the hon. secretary of the South Wales Group, an account of the subsequent meeting held in Swansea on April 9, when there was an attendance of about fifty and again a very useful gathering. On this occasion the speaker was the president, Mr. W. J. Jones, whose repetition of his address in London was very well received. Professor T. David Jones (Professor of Mining at the University College, Cardiff) presided. The vote of thanks to Mr. Jones was proposed by Mr. A. C. Thirtle and Mr. R. G. Isaacs, both of Swansea. The meeting was preceded by tea at the Mackworth Hotel. The mayor, Alderman T. W. Allison, was present, and later welcomed the Society to Swansea at the Technical College, where the meeting took place.

I.E.S. North-Eastern Group

This recently formed I.E.S. Group, which is expected to assume the dignity of a Centre in the near future, has already held several very successful meetings. Following the meeting in December last, when Mr. Maxted's paper on "Industrial Lighting under War Conditions" was given, a luncheon was arranged in Newcastle on January 6. The chairman, Mr. S. I. Ellis, presided. The toast of "The Illuminating Engineering Society" was proposed by Mr. W. F. T. Pinkney, and the president, Mr. W. J. Jones, who had come up to Newcastle for the occasion, responded. Mr. R. W. Gregory subsequently proposed the health of "The Chairman," whose services have been of great value to the Group in its early stages. A happy idea at a subsequent meeting on February 12 was the reading, by Mr. J. S. McCullough, of Mr. Jones's Presidential Address, illustrated by lantern slides which Mr. Jones had dispatched for the purpose. This led to an interesting discussion, keenness and enthusiasm being shown by those who took part. Incidentally, the Group has acted wisely in inducing Mr. Lennox to take on the task of recording proceedings. Other Groups and Centres might well consider the appointment of someone with the function of recorder or editor, thus relieving the secretary, who has other fairly arduous duties to perform.

Forthcoming I.E.S. Meetings

May 12th. The **Annual General Meeting** will take place, and the Report of the Council and Accounts for the past year will be presented.

Subsequently a Sessional Meeting will be held, at which an address on **Street Lighting, Past, Present, and Future,** will be given by MR. G. H. WILSON.

(In the Lecture Theatre of the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1.) **5 p.m.**

May 15th. MR. C. F. PARTRIDGE, on **Lighting Terminology** *(Meeting of the Midland Centre, at the Imperial Hotel, Temple Street, Birmingham).* **6 p.m.**

PERSONAL

We learn that Sgt.-Pilot R. A. Eshelby, a member of the I.E.S. and formerly technical assistant in the employ of Messrs. Philips Lamps, Ltd., is now known to be a prisoner of war, but, fortunately, uninjured. Sgt.-Pilot Eshelby had previously been reported missing, after having taken part in the *Scharnhorst* and *Gneisenau* Channel action.

Economy in Fuel

The problem of economising fuel, which had begun to become pressing towards the end of the last Great War, is once again to the fore. The reaction of illuminating engineers is influenced by two main considerations. In their view excess of light is an unusual condition; indeed, in most situations the amount of light provided is still far less than we could usefully enjoy, provided, of course, that the light is not misused, but is properly applied for the purpose in view. Furthermore, the possible savings in gas or electricity used for light are small in comparison with possible reductions where these commodities are used for heating and power purposes—and are of even less significance when compared with economies in the use of the raw material, coal, itself.

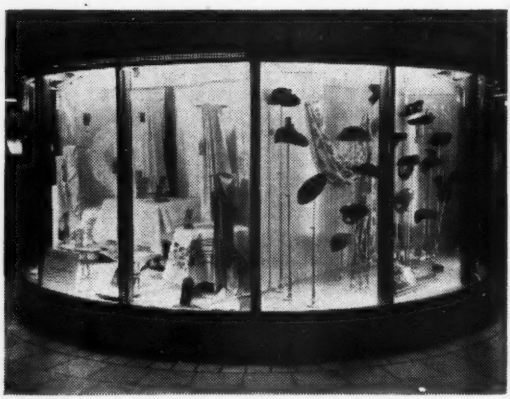
In certain directions, the lavish use of light for display purposes for example, opportunities for economy would normally exist, but such applications of light have been in abeyance during the war, certainly so far as outside lighting is concerned, and street lighting has practically ceased to be. Possible savings in the domestic field can hardly be very great. The most important demand for gas and electricity is doubtless in industry—but the vital importance attached to lighting in this connection is shown by the introduction of the Factories (Standards of Lighting) Regulations, 1941, and by the adoption of the I.E.S. code by the Ministry of Supply, the Admiralty, and the Ministry of Aircraft Production. Cutting down the lighting can hardly be advocated in this field. Another factor, shortage of labour and material, has, however, led the N.I.E.L.S. to propose that improvements should be partially curtailed.* This will presumably involve also some limitation of consumption of electricity. Investigations by experts are stated to have led to the belief that in any case the compulsory restriction of gas and electricity consumption is likely to prove difficult in practice. We shall see.

[*Proposals for a Fuel Rationing System, based on "points" and to be introduced in June, have since been announced, but are to be the subject of critical examination in the House of Commons.*—ED.]

* "Light and Lighting," Feb., 1942, p. 18.

Fluorescent Lighting at Leicester Square Station

Economy through increased efficiency is always welcome. A notable instance is the window lighting of Stagg and Russell, Ltd., at Leicester - square Station, where Siemens "Sieray" fluorescent tubes with a loading of 1.25 kW have replaced a load of 3 kW from filament lamps. The lighting, as the adjacent picture suggests, has not suffered. The actual illumination is 30 ft.c., as compared with 15 ft.c. from the old installation, and the "daylight" colour shows off the contents of the windows to great advantage.



Fluorescent Light Sources and Their Applications

Mr. Aldington's paper on the above subject, read before the I.E.S. in London on April 14, was noteworthy for its interest and the effective accompanying demonstrations — and also for the fact that it was first read before the I.E.S. North-Western Centre in Manchester (on January 15) and came on to London afterwards. The lecture theatre at the E.L.M.A. Lighting Service Bureau, where the meeting was held, was completely filled by an appreciative audience.

In opening his subject Mr. Aldington distinguished between two types of fluorescent sources, light modulators, of which the 80W. and 125W. quartz, high-pressure mercury lamps, with fluorescent bulbs, are modern examples; and those depending entirely on fluorescence, of which the familiar 80W. fluorescent tube is an example.

Mr. Aldington explained how the white light is obtained by the fluorescing of several inorganic powders, with the result that about ten times the light available from an uncoated tube is obtained. Other shades of colour can be secured by the use of appropriate powders, of which some pleasing demonstrations were shown.

The author explained the electrode system of the lamp and the control gear, dwelling in some detail on the operation of thermal, thermal glow, and magnetic switches. He emphasised the advantage of the low brightness of the tube and its resemblance to daylight—remarking on the departure from past experience, when each gain in efficiency usually involved greater brightness of the source. The applications of the lamp are at present mainly in industry, but varied types have been introduced in the United States, and manifold applications of them, for display and decorative effect, have been found.

In conclusion Mr. Aldington briefly reviewed some future possibilities—for instance, the continuous irradiation of large areas of fluorescent material, which has already been explored in connection with entertainments and display; the use of rare gases and metals other than mercury as sources of ultra violet energy, and the use of radiant energy of lower wavelength to excite fluorescence.

I.E.S. members will have an opportunity of studying the paper in full when it appears in the Transactions of the Society.

The E.D.A. Luncheon

The annual luncheon of the British Electrical Development Association, held at the Savoy Hotel (London) on March 20, still survives with much of its pre-war glory, and affords a good opportunity for the electrical supply industry to "take stock."

The principal guest on this occasion was the President of the Board of Trade, Mr. Hugh Dalton, who, in proposing the toast of "The Electrical Development Association," paid a warm tribute to the share of the industry in war production, and predicted a great future for it in time to come. The speech, however, served mainly to introduce the subject of fuel and power rationing. Mr. Dalton explained the circumstances which had led to the belief that a rationing scheme was necessary, and the reasons for not confining it to coal alone. He mentioned that Sir William Beveridge's plan was being prepared after consultation with the Joint Gas and Electricity Committee.

Alderman A. A. Sennington, who presided and replied to the toast, also gave instances of the industry's services in war-time. He was glad that, in connection with the rationing scheme, action was being preceded by consultation—a procedure not always followed by Government Departments.

Fluorescent Lamps

by

L. J. Davies, H. R. Ruff and W. J. Scott

Notes on a paper presented to the Installations Section of the Institution of Electrical Engineers on April 16th.

Actual quantity production of the fluorescent tubes, yielding white light, commenced in America in 1938, in connection with the New York World Fair. Preliminary work to secure uniformity and standardisation occasioned some delay in development in this country, but after the outbreak of war in 1939 the need for the lamp became evident, owing to the prolongation of work under artificial light and because of the need for a light which would mix well with daylight, and manufacturers determined to concentrate on the 80-watt 60-in. lamp as the most useful type.

After dwelling on this historical introduction the authors explained in detail the operating principles of the lamp and the process of conversion of energy by fluorescent materials; subsequently presenting a proposed basis of comparison for light sources differing in colour. According to this scheme the luminous efficiency of a lamp may be defined as a percentage of the efficiency available if all the input energy were radiated (i) in the visible spectrum in the proportions naturally radiated by that lamp, (ii) at the wavelength of maximum visibility, and (iii) as white light. These three efficiency figures are termed "Figures of Merit." The authors showed how such data could be obtained for fluorescent powders and compared with similar figures for familiar sources. Thus for the 80-watt fluorescent lamp, yielding 35 lumens per watt, "Figures of Merit" are respectively (i) 13.3 per cent., (ii) 5.6 per cent., and (iii) 15.6 per cent., whilst for the 75-watt tungsten lamp (operating at 11.7 lumens per watt) the corresponding figures are 5 per cent., 1.87 per cent., and 5.2 per cent. Much patient work was done in reaching agreement on colour appearance and colour-revealing quality.

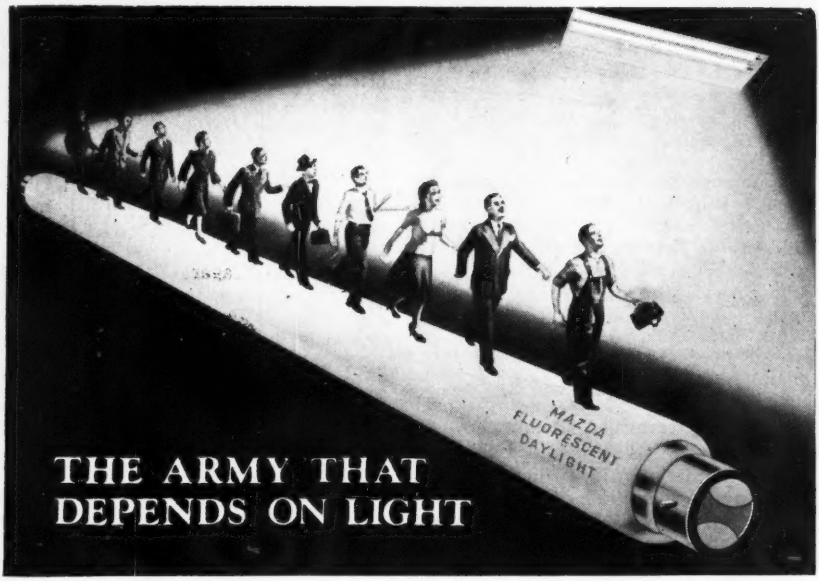
The middle section of the paper was concerned with the operation of the lamp and its accessories, and with its main characteristics. Attention is drawn to its low brightness, coolness, and high initial efficiency. The cyclic variation on A.C. is diminished by phosphorescence of the component fluorescent powders which, however, differ in this respect so that stroboscopic effects, when visible, are often associated with fringes of colour.

Instructive data were given in regard to life and maintenance. There is a very rapid fall in candle-power, from 120 per cent. to 80 per cent. in about a third of the normal life, but it should be noted that the assessed value (35 lumens per watt) corresponds with 100 per cent., which is 20 per cent. under the actual initial value. This initial fall in efficiency appears to be due to the formation of a film on the surface of the fluorescent particles, which prevents their full excitation.

The British 80-watt lamp is regarded as "the forerunner of a series of new lighting lamps." Possibilities in the future are illustrated by a table summarising sizes of ten different fluorescent lamps available in America, ranging from 6 to 100 watts.

Although the efficiency of fluorescent conversion powders is already high, further improvement up to about 70 lumens per watt is possible.

The paper gave rise to a keen discussion, several speakers referring to the "Figures of Merit" and the difficulty of assessing comparative efficiencies with coloured light Some attention was also drawn to the drawback of the high initial drop in candle-power and to the high cost of replacement of lamps, which partly offsets the high efficiency. It was pointed out that the light derived from the tubes, whilst pleasantly diffused, is not strictly "shadowless," and that for some purposes a ring-shaped symmetrical source might be preferable to the existing linear form.



The army of production, because it fights indoors, is entirely dependent on light. As soldiers can advance only as fast as their supply columns, so the Army of Production can produce only at the rate permitted by the standard of lighting in the factory.

That's why employers of men in vital industries are discovering how B T H Light-Conditioning can :–

INCREASE MANPOWER without employing a single new worker. How? Here is an example. A foundry was able to produce more castings in two shifts, with proper lighting, than it formerly produced in three.

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ELIMINATE WASTE. Mistakes in seeing are costly in both materials and men.

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The man at the lathe is the partner of the fighting man. Eyes and light are partners in seeing. Upon these partnerships to-day, more than ever before, depend the things we can't afford to lose. Better lighting can eliminate the handicaps, hazards and hidden waste that eyestrain so often imposes upon the army of production.

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Steps of Progress

Summary of a Report presented at the 35th Annual Convention of the American Illuminating Engineering Society (*Illuminating Engineering*, December, 1941).

Reference is made to the growing membership, both of the American and the British I.E.S., as a sign of sustained interest in lighting. Two outstanding points are noted—the increased attention given to visibility at extreme low levels of illumination, in connection with "blackouts," and the development of the fluorescent lamp, which is profoundly affecting lighting practice.

Higher Levels of Illumination

Attention is drawn to the progressive rise in illumination levels in the U.S.A., and to the increased recognition that illumination should be increased logarithmically for equal steps in visual response.* Pictures of recent installations of fluorescent lamps illustrate the tendency to increased illumination. In the case of over 600 general lighting installations values of over 50 ft.c. are recorded and an instance of a store with 170 ft.c. on the merchandise is cited. Changes in technique include the use of box and panel fittings, artificial laylights, and continuous rows or lines of light.

Special Fluorescent Lamps

New fittings adapted to fluorescent tubular lamps are appearing. Of special interest is a home portable lamp, consuming only 15 watts. Fluorescent tubes have proved otherwise acceptable in the home. The 36 in. tube, mounted above the pillow, forms an ideal lamp for reading in bed. Tubes are used on a large scale industrially. In the drawing office the shadow problem, reported in this country, has also been experienced and has been met by mounting lamps diagonally to the line of the boards. The cool nature of the fluorescent tube has mitigated some of the difficulties associated with the use of plastic materials. Amongst specialised units, the application of a new 3,000 watt mercury tube, 50 inches long and furnishing 120,000 lumens, in factories is receiving attention. This is said to be the highest powered single source for high mounting and industrial use yet developed.

*See also LIGHT AND LIGHTING, Jan., 1941.

Street Lighting

To Canada belongs the honour of having the longest stretch of inter-city lighted highway, a double lane between Toronto and Niagara Falls lighted with 6000 lumen lamps spaced at intervals of 150 to 200 ft. for 70 miles. An extension of 20 miles to Buffalo is in prospect. An unusual installation is the lighting of the Cape Cod Canal for 7.7 miles. One hundred and forty-six 10,000 lumen sodium units, spaced 500 ft. on each bank furnish a lane of light that can be followed even in the densest fog—thus eliminating what has hitherto proved a deterrent to regular traffic.

Railway Lighting

The railways in the United States have been experimenting with tubular fluorescent lamps, in some cases run off transformers, and have introduced fluorescent carpeting, excited by 2½ watt argon glow lamps attached to each seat, in sleeping cars. A new process for applying a polarising film to automobile headlight lenses is being developed. New forms of reflector-type lamps for use in sealed-beam headlights and new forms of aviation lights are recorded.

Miscellaneous Developments

Applications of ultra-violet light to decorative lighting in theatres continue. In some cases elaborate scenes and patterns on the walls and ceilings of cinema theatres have been treated in this way. Small argon lamps for exciting fluorescent plastic artificial flowers are becoming a vogue in the home.

Amongst miscellaneous other developments are mentioned the use of germicidal lamps for air purification, infra-red drying equipment, photographic flash lamps of small size and the use of decoy-lights to trap troublesome insects.

Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

(Continued from p. 37, March, 1942)

PHOTOMETRY

36. A Photometer for Fluorescent Fixtures.

H. W. Wrigley. El. World, 126, p. 2069, Dec. 27, 1941.

Some details are given of a large distribution photometer constructed specially for measurements on fittings for tubular fluorescent lamps. A number of special factors have to be considered, and the whole unit is on a scale not available in normal apparatus. Temperature effects are also considered.

S. S. B.

37. Practical Colour Applications.

R. L. Oetting and C. L. Amick. Magazine of Light, X., No. 9, pp. 36-41, Dec. 15, 1941; Magazine of Light, X., No. 10, pp. 20-39, December 31, 1941.

The use of a spectrometer in the energy measurement of the radiation of light sources is dealt with in detail.

C. A. M.

38. Brightness and Brightness Meters.

A. H. Taylour. Am. Illum. Eng. Soc. Trans., pp. 19-29, 1, Jan., 1942.

The range of brightness values found in nature by day and by night is discussed, and the bearing of the Purkinje effect on measurement of low brightnesses is considered. Meters for the measurement of high and low brightnesses are described.

J. S. S.

SOURCES OF LIGHT

39. Sunlamp Ratings.

L. C. Porter. Magazine of Light, X., No. 10, pp. 17-19, Dec. 31, 1941.

Special energy data are given for sunlamps.

C. A. M.

LIGHTING EQUIPMENT

40. Design Metal Heads for Street Lights.

O. K. Cornell. El. World, 114, p. 1340, November 2, 1940.

Details are given of a metal housing for street-lighting lanterns using a method of side-entry of the cables. Several advantages are given, including ease of assembly and reduction in temperature of the leads. Also increased mounting height is obtained.

S. S. B.

41. Headlamp History.

Anon. Magazine of Light, X., No. 7, pp. 24-25, Oct. 4, 1941.

An illustrated chart of automobile headlamps for the last forty years is given. Particulars are given of light source, reflectors, lens, and beam distribution.

C. A. M.

42. Improved Illuminator for Viewing Industrial Radiographs.

Philip M. Bailey. Journal of Scientific Instruments, Vol. 19, No. 1, Jan., 1942.

Describes an illuminated panel in the form of a box fitted with blinds to give an adjustable aperture for the purpose of viewing large numbers of industrial radiographs.

H. J. T.

APPLICATIONS OF LIGHT

43. Light and Architecture.

Anon. Am. Illum. Eng. Soc. Trans., pp. 15-18, 1, Jan., 1942.

Some representative architectural lighting schemes are described, with photographs.

J. S. S.

44. Foot-candle Levels.

W. M. Potter. Magazine of Light, X, No. 7, pp. 13-15, Oct 4, 1941.

Modern practice of shop interior lighting in America is illustrated. Illumination values have been adjusted to suit (1) service areas, (2) circulation areas, (3) merchandising areas, and (4) case and counter displays. In the instance dealt with these values are 7 to 15, 15 to 30, 30 to 70, and 70 to 150 ft.c. respectively. At each step the value is thus approximately doubled, and in consequence the general effectiveness at each stage is increased.

C. A. M.

45. Comfortable Lighting.

Ward Harrison, Matthew Luckiesh, Magazine of Light, X, No. 9, pp. 10-16 and 33-35, Dec. 15, 1941.

A study is made of the conditions governing comfortable seeing conditions, with particular attention to the problem of reflected glare, as in industrial installations.

C. A. M.

46. Relates Artificial to Natural Daylight.

Anon. El. World, 114, p. 1350, Nov. 2, 1940.

A table has been prepared giving the colour temperature of various grades of natural daylight (blue sky, overcast, sunshine at different times of the day, etc.), and listing the types of lamps, and combinations of lamps, available in America for giving artificial light of the same colour.

S. S. B.

47. The Physics of Art.

F. Ian G. Rawlins, M.Sc., F.R.S.E., F.Inst. P. Journal of Scientific Instruments. Vol. 19, No. 2, Feb., 1942.

In an article devoted mainly to a discussion of the applications of physics to the examination and restoration of paintings and manuscripts the author mentions some of the illumination problems involved in the glazing of pictures and the question of fading. The use of fluorescent tubes for lighting in art galleries and museums is also discussed.

H. J. T.

48. Lighting Large Factory Areas with Fluorescent Lamps.

G. J. Taylor. Magazine of Light, X, No. 7, pp. 17-23, Oct. 4, 1941.

Instances are given of the present-day practice in America on the use of fluorescent lamps in aircraft factories. Extensive roof areas are studded with fittings at a relatively close spacing, with a distance above working plane that may be 20 ft. or greater. Some brightnesses of various surfaces and light sources are also given.

C. A. M.

49. Indirect Fluorescent for Drafting Room.

Anon. El. World, 126, p. 2072, Dec. 27, 1941.

Experiments were made with direct, semi-direct, and indirect lighting units, all utilising tubular fluorescent lamps, before the final installation was decided upon, for the lighting of a drawing office to a level of 40 ft.c. Notes on the different systems are given, together with a comparison of costs.

S. S. B.

50. Fluorescent Lighting of Gauge Panels.

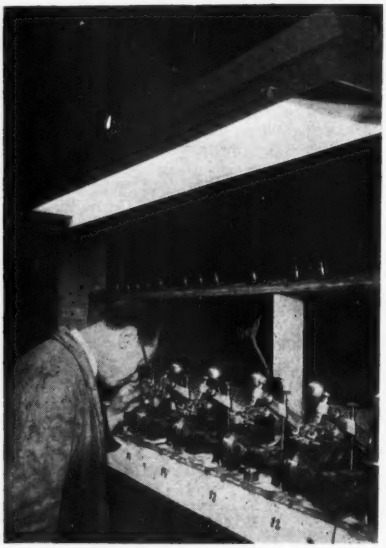
H. D. Green and *W. C. Woodman.* El. World, 126, p. 2036, Dec. 27, 1941.

A thorough study was made of methods of lighting gauge, instrument and control board panels, and a special lighting hood was designed, using tubular fluorescent lamps as sources. An alternative method, on the principle of the dash-board lighting of cars, using a false front, was also developed for situations where a projecting hood was undesirable. Illumination values of 5 to 8 ft.c. are provided.

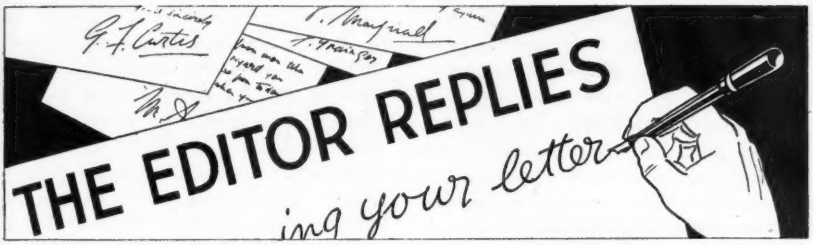
S. S. B.

Diamond Polishing: A New British Industry

One result of the occupation of Holland has been the setting up in England of a factory devoted to diamond polishing—a highly skilled and intricate process, demanding close examination of



minute, reflecting surfaces. Lighting conditions are therefore of outstanding importance. High illumination, resemblance to daylight, and avoidance of glare and glitter must be aimed at. The picture shows an operator examining a 50-carat diamond during the "sawing" process by the light of an Osram 80-watt fluorescent tube. Similar lamps are used throughout the factory.



My comments on **stair-case lighting** have brought a useful letter from Mr. E. W. Murray, who points out that a contrast of black and white can be seen even on the darkest of nights—provided the eye is not subject to dazzle. If the sides of the treads and rises are whitened for, say, 6 in. from each side wall and a similar distance up the wall vision is much improved. Such whitened areas are not affected by muddy boots and also make the more impression because they are seen by peripheral vision, which is more sensitive than direct vision at such low levels of illumination. Further improvement is obtained if a fitting similar to that shown in *Light and Lighting* recently (Oct., 1941, p. 149, Fig. 4) is provided over the centre of the flight of stairs.

So far Mr. Murray endorses what was said in last issue, but he goes on to remark that these measures are useless if the booking hall below is relatively brightly lighted. The contrast in such cases is sufficient to **neutralise the effect of "dim stair-case lighting."**

In this connection he applies an apt quotation from Shakespeare:—

"*Portia*: How far that little candle throws its beams.

"*Nerissa*: When the moon shone we did not see the candle.

"*Portia*: So doth the greater glory dim the less."

The Merchant of Venice.

All this is very true, but even these precautions, whilst mitigating danger, do not remove the fundamental cause of stumbling—that the actual point where the foot must be lowered is not evident. A recessed groove, inlaid with white, along the edge of each tread, would show where the surface terminated, and might possibly withstand excoriation by muddy boots.

Some remarks have been made on the risks involved in inadequate lighting. It has been suggested that absence of mind on the part of the public does not furnish exoneration for lighting conditions that are obviously unsafe. **Railways,** as well as **streets,** have been instanced as places in which a little alleviation of present lighting conditions is desirable. In the meantime, whilst recognising that many avoidable accidents and mishaps *are* due to the inherent folly of mankind, let us still aim, in these two cases, at a standard such that, in the words of the psalmist, "wayfaring men, *though fools,* shall not stray therein."

Some little doubt has been expressed in regard to **the "black-in" effect** mentioned in our last issue (p. 40). In order to show that this is not too imaginative a grievance I may quote an actual case reported in the *Daily Express* on March 10—that of Farren Soutar, the actor, who fell down a staircase in the darkness and was awarded £2,200 damages!

Mr. M. W. Hime, in a recent letter, expresses interest in the problem of **shadows** cast by fluorescent lamps discussed by Mr. Peirce at a recent I.E.S. meeting. Mr. Hime has himself adopted

arrangements of tubes similar to those recommended and has studied the problem by the aid of the "shadow factor." He found in one case that, owing to shadow, the illumination in a longitudinal direction was reduced from 25 ft.c. to 4 ft.c., but in a direction at right angles only to 12 ft.c. **Diminution in available illumination,** however, is only half the story. An indirect lighting installation may actually be almost "shadowless" in the sense that it gives no apparent shadow and therefore one does not experience inconveniences when using drawing instruments such as those mentioned by Mr. Peirce, nor is one conscious of any head-shadow when one bends over the work. But the illumination is, nevertheless, diminished, as photometric tests would quickly demonstrate.

The bumper volume recording the papers at the last **Annual Convention** of the **American I.E.S.** has excited interest. Some remarks on our notes on this subject have been made, notably in regard to the holding of Conventions or Congresses. Such gatherings meet an evident need in the U.S.A., where distances are so great. Are they desirable in Britain, especially in view of the annual events arranged (in normal times) by so many other bodies?

In the U.S.A. the **attendance at I.E.S. Conventions** has varied from 7 to 21 per cent. of the total membership, the latter certainly a high proportion. In this country similar proportions might well be realised. The position after the war (organisation of such gatherings must necessarily be deferred until then) should be more favourable owing to the growth of Centres and Groups, though at first it may be prudent not to plan on too ambitious a scale.

My attention has been drawn to statements in the Press in regard to **fuel savings** to be effected by "cutting down the light," for example on the Underground railways where "drastic reductions in the lighting of stations and trains" are promised. I very much doubt whether savings anything like those reported could be thus accomplished, and whether any real margin for economies exists. The chief change so far noted is the extinction of alternate lamps in some trains, and one had also the impression that the remaining lamps were not burning with their usual brightness. Are such "economies" worth while, bearing in mind the average power load of the system?

Many comments on this subject show little imagination. It is not unusual to read indignant comments on the extravagance of **burning lights** in shops and offices **"in the daytime"**—as though, with the rising of the sun, all need for artificial lighting ceased. People standing outside in full daylight do not seem to realise that only a fraction of this illumination may penetrate into regions inside buildings remote from the windows. Any illuminating engineer could confirm that the days in winter when the average city office can manage without artificial light entirely are few indeed. Indeed, even in the summer time artificial light must be used occasionally to "help out" in most offices.

Such "economies" should be judged in terms of the possible fuel-saving they can achieve, as compared with the inconvenience, irritation, and possible eye-strain which they produce. Some means of reducing consumption, under-running electric lamps for example, are inherently wasteful because we sacrifice perhaps 20-25 per cent. of light for the sake of saving 5 per cent. of electricity. True economies are those which diminish consumption without impairing the lighting. The **installation of fluorescent lamps** in Leicester-square Station—mentioned elsewhere (see p. 44)—is an excellent example, though, of course, present conditions forbid the general use of these lamps on a very large scale.